Robots Building With Goop

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ABSTRACT

Current algorithms for robotic construction focus on strategies for assembling discrete, pre-fabricated building materials, e.g. [1, 2]. These methods are difficult to extend to situations with sensing and actuation uncertainty or irregularly shaped clutter in the construction arena, yet these are exactly the dangerous situations in which rapid robotic construction would be particularly useful. For example, construction robots that can quickly and reliably build ramps, support structures, or levees in a disaster area.

Re-casting the construction problem into the continuous domain allows reasoning about goopy materials that comply to irregular surfaces as robots deposit them. By this mechanism, the building materials themselves absorb environmental uncertainty and algorithms can focus on high-level features, such as getting the right overall shape.

Structures are modeled as functions and depositions as operators that act on them. The iterative application of deposition operators models the construction process. By mapping robot behaviors to operators and designing behaviors so the corresponding operators have desirable fixed points and invariant sets, we can reason about the construction process with minimal assumptions about the initial construction environment. The contribution of our work is providing sound theoretical footing for the messy reality construction with goopy materials.

BODY

Physical systems have uncertainty. We embrace it and design robust algorithms for robotic construction with continuous, goopy materials.

REFERENCES

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